WHAT IS CLAIMED IS:

1. A connection device that connects layers of integrated circuits, comprising:

a first metal layer;

a second metal layer;

a plurality of re-configurable vias that connect the first metal layer to the second metal layer; and

an actuating element disposed between the first metal layer and the second metal layer, the actuating element changing a configuration of the plurality of re-configurable vias so that the plurality of re-configurable vias change between a conductive state and a non-conductive state.

2. The connection device of claim 1, wherein the plurality of re-configurable vias comprise a plurality of re-configurable phase change vias.

3. The connection device of claim 2, wherein each of the plurality of re-configurable phase change vias comprises a nanometer-sized pillar.

4. The connection device of claim 3, wherein the nanometer-sized pillar is made of $Ge_2Sb_2Te_5$.

5. The connection device of claim 3, wherein each of the plurality of re-configurable phase change vias comprises a spacer that surrounds the nano-meter sized pillar.

6. The connection device of claim 2, wherein the actuating element is a resistive heating element.

7. The connection device of claim 6, wherein the resistive heating element is a polysilicon layer.

8. The connection device of claim 6, further comprising a programming circuit that provides current to the resistive heating element to generate heat.

9. The connection device of claim 8, further comprising contacts that electrically connect the programming circuit to the resistive heating element.

10. The connection device of claim 1, further comprising:

a first dummy layer formed between the first metal layer and the actuating element; and

a second dummy layer layer formed between the actuating element and the second metal layer.

11. The connection device of claim 10, wherein the first and second dummy layers are dielectric layers.

12. The connection device of claim 11, wherein the first and second dummy layers are made of silicon dioxide.

13. The connection device of claim 1, wherein the first and second metal layers are made of tungsten.

14. The connection device of claim 1, further comprising an air gap between the heating element and the first and second metal layers.

15. A method of forming a connection device that connects layers of integrated circuits, comprising:

forming a first dummy layer over a first metal layer;

forming an actuating layer over the first dummy layer;

forming a second dummy layer over the actuating layer;

forming a second metal layer over the second dummy layer; and

forming a plurality of re-configurable vias through the first dummy layer, the actuating element and the second

dummy layer and between the first metal layer and the second metal layer.

16. The method of claim 15, wherein the step of forming a plurality of re-configurable vias comprises a step of forming a plurality of re-configurable phase-change vias.

17. The method of claim 16, wherein the step of forming an actuating layer comprises forming a resistive heating element.

18. The method of claim 15, wherein the steps of forming a first dummy layer and a second dummy layer comprise forming a first dielectric layer and a second dielectric layer, respectively.

19. The method of claim 17, wherein the step of forming the plurality of re-configurable phase change vias comprises:

forming a plurality of openings through the first dummy layer, the actuating layer and the second dummy layer and between the first metal layer and the second metal layer; and

forming pillars in each of the plurality of openings.

20. The method of claim 19, wherein the plurality of openings are formed by a self-assembly templating method.

21. The method of claim 19, wherein the step of forming the pillars in each of the plurality of openings comprises:

forming a phase change material layer over the second dummy layer so as to fill the plurality of openings with phase change material; and

polishing the phase change material layer to be flush with a top surface of the second dummy layer.

22. The method of claim 21, wherein the phase change material layer is made of $Ge_2Sb_2Te_5$.

23. The method of claim 21, further comprising:

forming spacers in the plurality of openings before forming a phase change material layer.

24. The method of claim 17, further comprising:

forming electrical contacts over the resistive heating element; and

forming a programming circuit that provides current to the resistive heating element through the contacts so that the heating element heats up the plurality of re-configurable phase change vias to change the plurality of re-configurable vias between a conductive state and a non-conductive state.

25. The method of claim 17, wherein the resistive heating element is made of polycrystalline silicon.

26. The method of claim 15, further comprising:

removing the first dummy layer and the second dummy layer so as to form air gaps between the actuating layer and the first and second metal layers.

27. The method of claim 26, wherein the step of removing the first and second dummy layers comprises:

forming a plurality of tap holes in the first dummy layer, the actuating layer and the second dummy layer; and

etching the first dummy layer and the second dummy layer through the plurality of tap holes to form an air gap between the actuating layer and the first and second metal layers.

28. The method of claim 26, further comprising:

forming a dielectric layer over the plurality of tap holes to seal the plurality of tap holes.

29. A method for programming a connecting device having a plurality of re-configurable phase change vias used to connect layers of an integrated circuit, comprising:

providing current to a resistive heating element in which the plurality of re-configurable phase change vias are embedded so that the heating element heats up the plurality of re-configurable phase change vias to change the plurality of re-configurable phase change vias between a conductive state and a non-conductive state.

30. The method of claim 29, wherein the step of providing current comprises providing current through a programming circuit.

31. The method of claim 29, wherein the resistive heating element is made of polycrystalline silicon.